



# Managing risk, changing aspirations and household dynamics: Implications for wellbeing and adaptation in semi-arid Africa and India



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## ABSTRACT

Semi-arid regions across Africa and Asia are characterized by rapidly changing biophysical regimes, structural vulnerabilities, and increasing livelihood precarity. Gender, class, and caste/ethnic identities and relationships, and the specific social, economic and political power, roles and responsibilities they entail, shape the choices and decisions open to individuals and households in managing the risks they face. Unpacking the multiple, intersecting inequalities confronting rural populations in these climate hotspots is therefore vital to understand how risk can be managed in a way that supports effective, inclusive, and sustainable local adaptation. Drawing on empirical evidence from six countries, generated through a mixed methods approach, we examine how changes in household dynamics, structure, and aspirations, shape risk management with implications for household well-being, adaptive capacity, and ultimately sustainable development. The ability of individuals within households, differentiated by age, marital status, or education, to manipulate the very structure of the household and the material and social resources it offers, differentiates risk management strategies such as livelihood diversification, migration, changing agricultural practices and leveraging social support. Our evidence suggests that while greater risks can drive conflictive behavior within households, with women often reporting lower subjective wellbeing, new forms of cooperative behavior are also emerging, especially in peri-urban spaces. Through this study, we identify entry points into enabling sustainable and inclusive adaptation behavior, emphasizing that interventions should work for both women and men by challenging inequitable social and gender norms and renegotiating the domains of work and cooperation to maintain overall household wellbeing.

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## 1. Introduction

There is a growing body of empirical evidence on how women and men within households and communities respond to climatic and non-climatic risks (Bunce & Ford, 2015; Ravera, Iniesta-Arandia, & Martín-López, 2016; Jerneck, 2017; Rao, Lawson, & Raditloane, 2017; Flatø, Muttarak, & Pelsler, 2017). Their vulnerabilities and adaptive capacities are not just gendered, but shaped

by their geographical locations and the socio-cultural, economic and political structures and processes in which they are embedded (Carr & Thompson, 2014; Niang, Dansokho, & Faye, 2010; Quinn, Huby, Kiwasila, & Lovett, 2003). Yet one finds two broad narratives at play in relation to gendered vulnerability and adaptation (Jackson, 1993; Arora-Jonsson, 2011; Tschakert & Machado, 2012). The first talks of women as victims of environmental change, burdened by growing poverty and livelihood precarity, unable to build resilience to climate impacts due to their socially-constructed roles as carers and dependents (Bhatta, Aggarwal, Poudel, & Belgrave, 2015; Bhagat, 2017). A second body of work critiques this approach to highlight women as agents of change who actively cope with and adapt to climatic and non-climatic stressors (Tschakert & Machado, 2012). Arora-Jonsson

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(2011) cautions against “generalizations about women’s vulnerability and virtuousness” and calls for looking at gendered vulnerability as resulting from “complex and intersecting power relations”, not “a binary phenomenon carrying certain disadvantages for women and women alone” (p. 7).

This points to the need to look beyond individual women and men to the institutional and environmental contexts that mediate both vulnerabilities and responses to increasing climatic risks (Rao et al., 2019b). The semi-arid regions (SARs) in Africa and India that we focus on are projected to become hotter and drier (Table 1). Increasing climate variability and climate change are already impacting food production, water availability and ecosystem functioning. They pose significant risks to human and natural systems, notably agro-pastoral livelihoods in these regions (Singh, Rahman, Srinivas, & Bazaz, 2018; Bhatta & Aggarwal, 2016; Kilroy, 2015; Antwi-Agyei et al., 2016; Bryan, Deressa, Gbetibouo, & Ringle, 2009). Collectively, these changes have critical implications for household dynamics such as headship, assets, agency and aspirations and shape how risks are perceived, planned for, and responded to.

Within the growing body of climate change vulnerability and adaptation research, however, the link between *changing* household structure, risk management, and its outcomes for wellbeing and adaptive capacity are underexplored. While gender relations are integral to household risk management in SARs (Ahmed, Lawson, & Mensah, 2016; Harriss-White & Garikipati, 2008), we hypothesise that changing households (their headship and composition), their assets, aspirations, place-attachment, and notions of belongingness and identity (Singh, 2019a; Robson & Nayak, 2010; Appadurai, 2004) are also key. In this paper, we use empirical evidence from five countries across Africa<sup>1</sup> and three sites in the Indian subcontinent to address this evidence gap. We use the lenses of risk (IPCC, 2014; Wisner et al., 2004), agency (Kabeer, 1999; Rao et al., 2017) and well-being (White, 2015a; Coulthard, Johnson, & McGregor, 2011) to examine two broad questions:

1. What strategies do households and individual women and men employ to manage risk and how are these differentiated by household structure, intra-household dynamics, and beyond-household networks?
2. How do these strategies impact women’s and men’s wellbeing and overall household adaptive capacity?

After setting out our conceptual starting points in Section 2, we describe the methodologies used to generate the data drawn on in this paper in Section 3. The empirical Sections 4 and 5 are framed around two of our core concepts, responding to risk and wellbeing outcomes. While Section 4 uses the examples of four risk management strategies to test the first hypothesis, variations in outcomes, both wellbeing and adaptive capacity, across scales, is discussed in Section 5. Implications for household adaptation are discussed in the concluding Section 6.

## 2. Conceptual starting points: household dynamics, risk management, wellbeing and adaptation outcomes

### 2.1. Household dynamics: changing household structures, agency, and aspirations

Conceptually, we seek in this paper to develop an improved understanding of people’s social and cultural position in differenti-

ating both vulnerability and responses to the impacts of climatic risks. Influenced in part by demographic characteristics (size of household, age, marital status, sex and education of members), and in part by the contextual place-time specificities in which they are embedded (Van Aelst & Holvoet, 2016; Deressa, Hassan, & Ringler, 2011; Nabikolo, Bashaasha, Mangheni, & Majaliwa, 2012; Below, Schmid, & Sieber, 2015), such as caste in India (Ahmed & Fajber, 2009) or ethnicity in Africa, women’s (and men’s) specific life-cycle position within household structures (Rao, 2014), play a central role in mediating adaptation options. This happens through legitimising particular forms of work participation and access to assets, everyday forms of agency and leadership roles (Caretta & Börjeson, 2015), and changing aspirations for themselves and their households, especially children, that together contribute to the transmission of (dis)advantage across genders and generations (Bowles, Gintis, & Groves, 2005; Bird, 2007).

Structurally, female-headed households are typically seen as more vulnerable than male-headed households. This is due to patriarchal norms leading to insecure ownership of productive resources (land, livestock, water, technology), full responsibility for both productive and reproductive work, lack of voice and representation in community decision-making fora, and limited access to state support services (subsidies, information) (Seebens, 2011; Sultana, 2014; Jost, Kyazze, & Naab, 2015; Perez, Jones, & Kristjanson, 2015; Belay, Recha, Woldeamanuel, & Morton, 2017; Flatø et al., 2017). Data from the Demographic and Health Surveys across ASSAR countries, however, indicate a rise in female headship in semi-arid Africa and in India between 1992 and 2006<sup>2</sup>, pointing potentially to growing vulnerability (Fig. 1).

Yet, there is great diversity within this category, including women in polygamous marriages (in Kenya, Ghana and Mali), widowed women, and those separated or abandoned. Feminist scholarship points to the need to understand the reasons and conditions under which households come to be headed by women in order to understand the nature of vulnerability (Chant, 2015). These could range from the traditional reasons of male migration, non-marriage or marital breakdown (Posel, 2001) to more contemporary issues of premature HIV/AIDS related deaths (primarily in Africa) (Schatz, Madhavan, & Williams, 2011), each with different implications for vulnerability. In South Africa, for instance, households headed by women who had been through a separation or divorce were worse off when compared to households where the male member had died (Flatø et al., 2017). Similarly, the drivers of male migration to urban areas, whether macro-economic changes that have increased the availability of non-farm opportunities for men, or the unviability of agriculture, due in part to climate-related stressors, can shape experiences and outcomes (Haigh & Valley, 2010; Masters, Djurfeldt, & De Haan, 2013).

A further demographic shift is visible in terms of household size (Figure 2). Across contexts, we find a decline in large households with over 10 members and an increase in smaller ones. Yet, the proportion of medium sized households (6–10 members) has remained almost constant. In the current context of environmental stress and shifting livelihoods, this seems to suggest a halt in the process of nuclearization of households. Matrifocal households, with single women seeking to join their natal kin (Jackson, 2015) constitute at least a part of the rise in female-headed, but equally multi-generational, and medium-sized households, especially in Africa. Despite this recent scholarship, critical gaps remain in understanding how shifts in household composition impact risk management and adaptation (Toole, Klocker, & Head, 2016; Singh, 2019a).

<sup>1</sup> These are Ghana, Mali, Ethiopia, Kenya, and Namibia. The findings are part of a five-year-long research project Adaptation at Scale in Semi-arid Regions (ASSAR) that seeks to provide new insights into the barriers and enablers to sustainable and effective adaptation in climate hotspots. See [www.assar.uct.ac.za](http://www.assar.uct.ac.za).

<sup>2</sup> The exceptions are Ghana and Mali, which reveal a marginal decline, explained by the persistence of polygyny in this region.



**Table 1**

Projected area averaged median temperature and rainfall values change for case study African countries, and Indian states at the time of global warming of 1.5 and 2.0 °C. Data is from 81 CMIP5 climate model simulations under the RCP8.5 forcing scenario.

Country	Median 1.5 °C		Median 2 °C	
	Rainfall (mm)	Temperature (°C)	Rainfall (mm)	Temperature (°C)
Botswana	−37.45	2.02	−50.4	2.71
Ethiopia	17.75	1.77	20	2.35
Ghana	−69.4	1.63	−9.36	2.19
Kenya	33.7	1.63	41.7	2.19
Mali	−1.5	2.21	−4.585	2.95
Namibia	−29.2	2	−48.5	2.78
India				
Karnataka	1.74	1.53	28.66	2.08
Tamil Nadu	19.97	1.43	47.35	1.89

Data source: Zaroug, New, and Lennard (2019), Yaduvanshi et al. (2018).

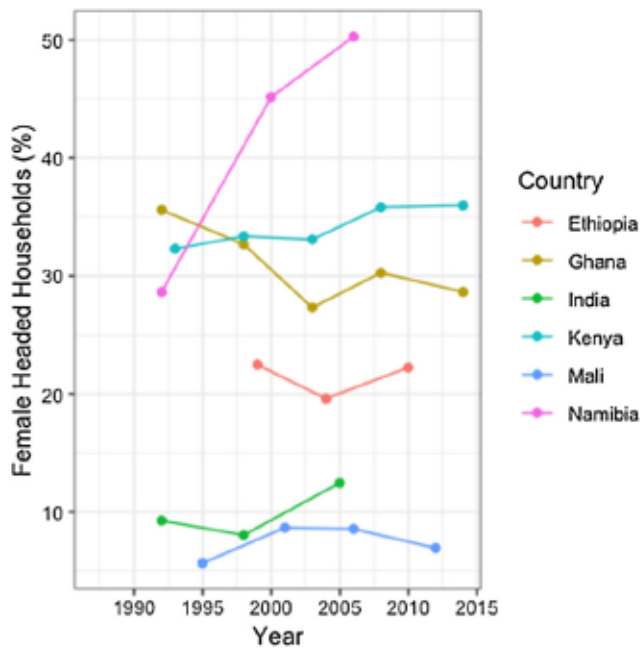


Fig. 1. Change in percentage of Female Headed Households in the case study countries. Source: Authors, tabulated from DHS survey.

It is important here to acknowledge that both these elements comprising household structure – headship and composition – mediate intra- and inter-household relations negotiations around choices and strategies, and the exercise of agency, with implications for wellbeing outcomes (Rao, 2015). In discussing intra-household relations, Sen (1990) highlights the importance of perceptions, in recognizing both ‘interests’ and ‘contributions’. While women’s contributions to the domestic economy are significant, they are undervalued, with negative implications for both women’s agency and wellbeing (Ibid.). Agency here needs to be disentangled analytically from the achievement or not of wellbeing (an outcome), as women often act to promote the interests of their children or other family members at the cost of their own interests, in particular, health and leisure time. Nevertheless, agency is a key dimension of power; an expression of a person’s ‘ability to define one’s goals and act upon them’ (Kabeer, 1999: 438). Agency can be expressed in multiple ways, both overt and covert – from active engagement and resistance, to more subtle forms of negotiation, backstage influence and even endurance (Kabeer, 1999; Reader, 2007), depending on the recognition of and support for their contributions – whether material, financial or social.

Agency works at the individual level, but in contexts of stress, where choices are limited, it is often expressed collectively, with groups of women engaging in labour or asset sharing arrangements (Andersson & Gabrielsson, 2012). In northern Kenya, women facing extreme water scarcity collectively organised water for domestic

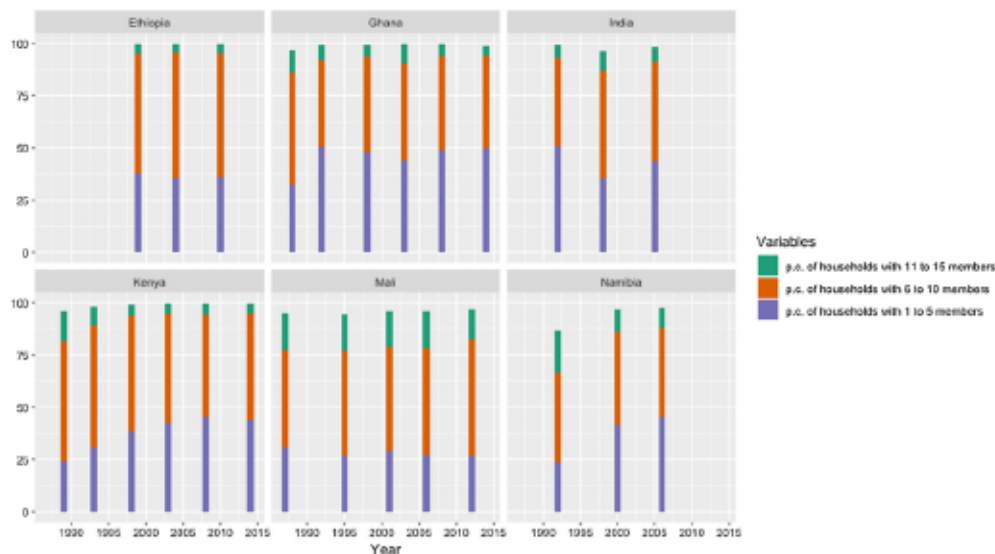


Fig. 2. Variation of household size in study regions. Source: Authors, tabulated from DHS survey.

use and consumption (Rao et al., 2017). However, other (ethnic) groups, seen as competitors, were excluded from such efforts (Thomas-Slayter, 1992). While agency strengthens adaptive capacity, at times collective agency operating through community-based interventions, can become exclusionary in nature, leaving out the poorest or most marginalised who cannot offer reciprocal services or goods.

Apart from structure and agency, the role of aspirations is critical in livelihood decisions, such as whether to migrate (Suckall, Fraser, & Forster, 2016; Scheibelhofer, 2017; Singh, 2019a), or change cropping, pastoral or other labour practices (Punch & Sugden, 2013; Rigg, 2006), to manage risk in contexts of socio-ecological transitions. Ray (2006) explains how poor individuals aspire to those possibilities within their *aspirations window* (those in similar or 'attainable' positions) and the gap between one's present condition and aspirations drives individual decisions. In the context of adaptation, the idea of an aspirations window can give insights into why some people do not feel able to adapt when faced with multiple risks. Such a focus can also help understand drivers and processes of cooperation and conflict within households, and indeed communities.

## 2.2. Managing risks

Risk in simple terms is the potential for damage, loss, or any other adverse consequence resulting from the interaction of vulnerability (of the affected system), its exposure over time (to the hazard), as well as the likelihood of its occurrence (IPCC, 2018). While outcomes are uncertain, the worst impacts may be avoided through pre-emptive action. Agricultural and pastoral livelihoods in the SARs are sensitive to a wide array of risks: climatic risks such as increasing rainfall and temperature variability (Sarr, 2012; Ramarao, Sanjay, & Krishnan, 2018); social risks such as conflict over resources and weakening kinship ties (O'Laughlin, 2007; Flatø et al., 2017); and market risks such as poor access or price fluctuations (Barrett, Barnett, & Carter, 2007). These risks, however, work in combination with each other, and are mediated by local social, cultural, biophysical, and political conditions and processes (Wisner, Blaikie, Cannon, & Davis, 2004; Ribot, Magalhães, & Panagides, 2005; Deressa et al., 2011; Bryan, Ringler, & Okoba, 2013; Kilroy, 2015; Singh et al., 2018b).

Risk management strategies, understood here as 'plans, actions, strategies or policies to reduce the likelihood and/or consequences of risks or to respond to consequences' (IPCC, 2018, p. 557), then operate within the context of the risks households are exposed to (vulnerability context) and the institutional systems they are embedded in (institutional context) (Adger, Brown, & Surminski, 2018; Adger, Huq, Brown, Conway, & Hulme, 2003). In an early authoritative work on risk, and its management, Wisner et al. refer to the 'combination of factors that determine the potential for people to be exposed to particular types of natural hazard', but also how 'social systems and their associated power relations impact on different social groups' (2004:7), pointing to the material capacities and social opportunities available to different groups of individuals and households. Following this, several studies examine the range of strategies, both short and longer-term, for coping with risks such as floods and drought (Adams, Cekan, & Sauerborn, 1998; Bryan et al., 2009; Quinn, Ziervogel, Taylor, Takama, & Thomalla, 2011; Antwi-Agyei et al., 2016; Bhatta & Aggarwal, 2016).

Shipton (1990), in the context of Africa identified three broad sets of prevention strategies: livelihood diversification; consolidating savings into illiquid, indivisible, or incontestable forms; and social investment. In the current context of climatic stress, households also engage in proactive risk management such as investing in water storage structures or taking weather-based insurance

(Singh et al., 2018b). Once crisis hits, however, people cope by liquidating assets, using their labour, especially through migration (Djoudi, Locatelli, & Vaast, 2012; Singh & Basu, 2019), and drawing on social and kinship networks (Flatø et al., 2017). Strategies initially seek to be least disruptive, for example, diversification, consuming cheaper and less nutritious food, or splitting into smaller household units (Adams et al., 1998). As situations become dire, they expand to include pledging land, selling assets, and getting rid of dependent kin (Shipton, 1990). The preventive, proactive and reactive measures are all conscious strategies that balance the resources and opportunities people have access to and the time horizons they are working with (Crown & Sebstad, 1989).

In a classic paper drawing on examples from across Africa, South and Southeast Asia, Jiggins (1986) explores the range of strategies open to women for coping with seasonality and crises. These include switching tasks and responsibilities ascribed by gender, changing the intensity and mix of multiple occupations, and strengthening forms of social organisation and support. There is growing consensus over the vital role of subjective and relational factors in addition to objective measures of capacity in human response to environmental change (Brown & Westaway, 2011). While men, especially younger men, often end up migrating in search of employment and incomes, women take to managing traditionally male activities in addition to new activities (Djoudi & Brockhaus, 2011; Nguyen, 2014; Singh et al., 2018b). In some instances, especially disasters, socially produced gender relations such as caregiving roles, childhood socialization, and clothing norms, can adversely affect their abilities to survive (Hunter & David, 2009; Goh, 2012; Perez et al., 2015; Belay et al., 2017). Clearly, intersecting identities, which are a function of gender, age, caste, ethnicity, shape response behaviour (Perez et al., 2015; Rao et al., 2017).

## 2.3. Outcomes: from individual wellbeing to local-level adaptation

We now turn to examine how changing household characteristics and their risk management strategies have differential outcomes at different scales (Fig. 3). Our conceptual framework depicts how household characteristics (Box 1) are dynamic due to shifts in individual identities, household headship, differential access to assets, agency and changing aspirations. These dynamics mediate strategies to manage risk (Box 2) which include (in our study areas) livelihood diversification, rural to urban migration, changing agricultural practices, and leveraging support mechanisms such as government social safety nets or drawing on kinship ties. We hypothesise that strategies to manage risk can have multi-scalar outcomes (Box 3): on individual wellbeing, on household adaptive capacity and local adaptation processes, and at a longer and wider scale, on systemic sustainability<sup>3</sup>. Having discussed key scholarship on changing household structures in Section 2.1 (Box 1) and gendered risk management in Section 2.2 (Box 2), here we discuss the multi-scalar outcomes of these strategies (Box 3). We would like to highlight that in reality, risk management choices (filtered through social and individual identities and conditions), and their outcomes at different levels do not move in a linear path as Fig. 3 might suggest. The blue arrows attempt to highlight how risk management outcomes loop back to shape household characteristics (e.g. migrating out changes household composition, which further shapes what strategies a household takes).

At household or individual levels, risk management strategies shape well-being through measurable impacts on income, workloads, assets, food security, health and education outcomes

<sup>3</sup> While we acknowledge that risk management strategies have implications on system-wide sustainability, this is beyond the scope of this paper, which focuses on the individual and household scales.



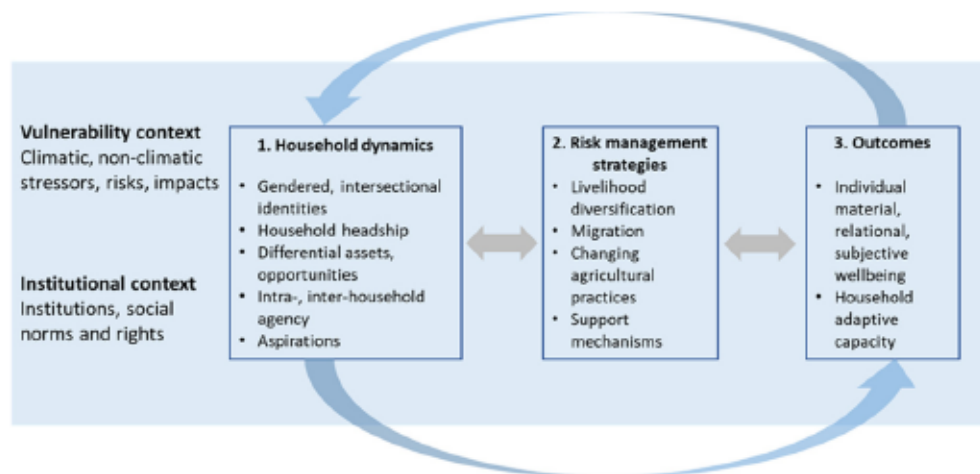


Fig. 3. Conceptualising the links between household structure and risk management. Source: Authors' conceptualisation.

(Coulthard et al., 2011; Armitage, Béné, & Charles, 2012; Hoque, Quinn, & Sallu, 2017). Well-being research has however expanded beyond these indicators of material well-being to explore relational and subjective dimensions of well-being (White, 2010; Coulthard et al., 2011; White, 2015a, 2015b). Breakdown in marital relationships for instance can lead to a decline in economic and emotional wellbeing, which may be addressed through relationships with parents, siblings or friends. Similarly, perceptions of success or failure in meeting one's aspirations can lead to personal satisfaction or dissatisfaction, with implications for wellbeing.

Risk management strategies also impact household adaptive capacity, i.e. the potential of households to adapt to risks; and contribute to local adaptation processes (Engle, 2011; Mortreux & Barnett, 2017). While several strategies such as diversifying livelihoods, agricultural intensification, or migration, are typically understood as positive in helping build household adaptive capacity through the mitigation of risk and enhancement of food security (Gladwin, Thomson, Peterson, & Anderson, 2001; Niehof, 2004; Adams et al., 1998), the outcomes are mixed. At the individual level, women's workloads (Bhattarai, Beilin, & Ford, 2015), and at the collective level, inequalities within and between communities, appear to be increasing. This is further discussed in Section 5.

### 3. Methodology

The research synthesised in this paper has been largely collaborative and iterative in nature, facilitated by the authors' ability to meet regularly, discuss themes emerging in our field sites and find ways of conceptualising them through a gender lens. Our early insights on gendered vulnerability emphasized the importance of moving beyond the counting of numbers of vulnerable men and women to unpacking relations of power, of inclusion and exclusion in decision-making (Rao et al., 2017). This contributed to the framing of our research questions, outlined in Section 1. While all the ASSAR sites had different approaches to their research, we broadly followed a mixed methods approach that foregrounded qualitative research methods and used household surveys to provide contextual information. The qualitative approaches included focus group discussions to understand the normative context of responding to climatic stress in semi-arid conditions and in-depth life history interviews to grasp the nuances of how people cope and adapt on an everyday basis. Data was triangulated by using multiple methods with a range of respondents in the study sites (see Table 2).

The rationale for site and sample selection varied across the countries, though the common theme was a focus on semi-arid contexts experiencing climate variability. While other studies have been conducted in these regions, none of them have specifically examined household dynamics, and the gender relations therein, as a key institutional site for adaptation. The sampling approaches used included stratified random, purposive, quota and convenience sampling. For example, in India (Tamil Nadu), the Bhavani region was chosen because it is semi-arid with frequent droughts and depleted groundwater resources. Sampling for the survey was done using two-stage stratified sampling where villages that were predominantly agricultural were chosen to capture caste and land-holding characteristics in the region. Proportional stratified sampling was then used to get proportional representation of caste and land holding size within each village, drawing on demographic data from the census and household data from the local government (panchayat) office. Conversely, in Namibia, the study was concentrated in three villages selected according to the settlement patterns of three different ethnic groups, and individual participants for focus group discussions were chosen according to ethnic group and gender. This helped in identifying specific households to be interviewed during the in-depth interviews phase.

Understanding household dynamics posed a methodological challenge for our research in that household strategies were constantly changing in response to both climatic and non-climatic factors. Hence what women and men told us on one occasion could change when we visited them next during the course of our research. For example, when we started our research in Northern Kenya in October 2015, drought was at its peak, herds had died, and conflict between groups for water and pasture was intense. Water for domestic consumption too had to be purchased at high costs. For women, arranging water was a major task – whether travelling long distances, or earning adequate money to purchase water. However, by May 2017, there had been some rains, and the crisis was no longer severe. The issues confronting them were different – they related to education and employment, and opportunities outside pastoralism, rather than drinking water. Household dynamics involve both conflict and cooperation, so rather than the changing dynamics questioning the efficacy of our research, the successive phases of data collection – from understanding the context through focus groups and participatory mapping, to a household livelihood survey and finally life history interviews – provided deeper insights into the dynamics of lived realities.

Other limitations were identified by the researchers which related to both the research design and the sampling strategy.

**Table 2**  
Methods used across six research sites.

Case	Method/sample 1	Method/sample 2	Method/sample 3
Ethiopia	35 life history interviews with men and women spanning rural, peri-urban and urban and stratified by household type	Household survey (n = 295) with household head and senior man/woman, spanning three rural and peri-urban communities. Stratified random sampling based on village sample frame	
Kenya	55 life history interviews with men and women across two rural and one peri-urban site, stratified by household type	Household survey (n = 297) in three rural sites with household head and senior man/woman (spouse if available). Stratified random sampling based on village sample frame	Focus group discussions differentiated by age and gender (n = 8) Participatory mobility mapping with groups of men and women in the rural site
Mali	41 in depth interviews with older women and men; young men and women in 7 villages	Key informant interviews in the district of Koutiala	5 mixed gender FGDs in 5 villages of M'Pèssoba in the district of Koutiala
Ghana	5 key informant interviews (district crops officer, agricultural extension officer, project manager and chairman of CCAFS <sup>1</sup> , project desk officer and an opinion leader/retired agriculturalist)	Household survey (n = 180) in 4 rural communities with groundnut farmers in Lawra and Nandom District Household survey (n = 240) in 3 rural communities in the Lawra District with women farmers Both surveys were convenience sampled	8 gender-differentiated focus group discussions in 4 groundnut farming communities
Karnataka, India (rural and peri-urban)	30 life history interviews with men and women; 10 key informant interviews with local government officials, community leaders	Rural household survey (n = 825) in 17 villages across Kolar and Gulbarga districts, using a two-staged random stratified sampling strategy. Households were randomly chosen based on a proportional representation of landholding and caste. Peri-urban household survey (n = 797) in 16 villages of the Bangalore Metropolitan Region	26 gender-differentiated FGDs in rural areas; 5 FGDs across 5 villages in Bangalore Metropolitan Region. Participatory exercises in FGDs involving timeline mapping, risk and response ranking, and stakeholder maps
Tamil Nadu	50 in-depth interviews to capture differences in age and gender	415 households surveyed from Panchayat sample frame, stratified by caste and class	FGDs conducted in 4 Panchayats involving risk mapping and timeline mapping
Omusati Region, North-central Namibia	48 in-depth interviews spread among the three ethnic groups	Household survey (n = 286), purposively sampled, Secondary data from the 2011 Census, 2013 Demographic Health survey	9 focus group discussions 3 in each ethnic group – 1 Mixed; 1 Female and 1 Male FGD

<sup>1</sup> CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

For example, most surveys only captured one time period and did not generate panel data so we couldn't assess changing livelihoods, migration patterns, or remittances over time. In India, they were administered to the household head alone, which reduced the number of women surveyed and masked intra-household differences. In all sites they were administered to older adults which reduced the extent to which the data could address youth aspirations. Namibia and Ghana used convenience sampling which reduced the representativeness of the data, even in relation to the participants' communities.

Given the sensitive and often difficult nature of questions asked, especially in the life history interviews, it was particularly important to follow ethical procedures, beyond obtaining ethical clearance from our respective institutions. In some cases, interviews were stopped, or continued in second and third meetings. For example, in Karnataka (India), life histories with women respondents were often conducted first in the presence of the husband (in keeping with social norms), and later followed up with the women alone to get their perspectives. At times, interview locations had to be changed to facilitate these follow-up conversations.

As the methodology was not predominantly quantitative and the samples were rarely representative, survey data was analysed only descriptively using SPSS and is largely not reported in the text. Our aim was to generate data in comparable ways rather than have a comparative dataset and consequently we did not have survey indicators that were exactly the same across countries, with the exception of some of the wellbeing indicators reported in Table 4. The qualitative data was analysed using simple thematic analysis

and some countries coded their data using data analysis packages such as NVIVO to facilitate this.

#### 4. Responses to risk

Households undertook various responses to manage risk across the study sites. We discuss four key response strategies – livelihood diversification, migration, changing agricultural practices, and leveraging support mechanisms – reviewed in Section 2.2. Our contribution is to show how these were shaped by household structure and composition. While large household sizes have been declining across contexts, the proportion of female headed households has been increasing (Figs. 1 and 2). Yet these statistics do not in themselves reflect the variability in lived experiences between, for instance, polygamous and monogamous households, multi-locational or multi-generational households. Some of these nuances are discussed in this section, with implications for wellbeing drawn out in Section 5.

##### 4.1. Livelihood diversification

Livelihood diversification is a key response to climatic and non-climatic stressors. Options for diversification are gendered, shaped not just by the available resources or 'capitals', but equally by cultural norms and social institutions including marriage practices and gift exchanges. These mediate mobility, agency, and resource access, among other factors (Ellis, 2000; Niehof, 2004).



Across locations, while older men seemed to be making decisions about and managing their agricultural or pastoral livelihoods, young men appeared to be in crisis, unable to make a living or fulfil their aspirations. Without land or livestock, they were migrating in search of work, joined by young women in Ethiopia and Namibia. Urban labour market opportunities are gendered, with women engaging in domestic service provision or petty trade, while men looked for jobs in manufacturing, construction, transportation or services. Some sought education, but this did not necessarily result in appropriate jobs to suit their skills and needs. In India, opportunities were further mediated by caste identity, as noted also by Thorat and Newman (2010), and in Namibia, Ethiopia and Kenya by ethnicity, and the resources and networks these offered. In many cases, lack of secure employment for young men has meant an inability to marry and engage with tasks of household reproduction, important for their identities as men. This too has contributed to the existence of a large number of separated or women-only households (Rao, 2019).

Where women are able to earn, and clearly perceived as contributing to household incomes (c.f. Sen, 1990), they have gained considerable say in household spending, especially on children's education. With access to new information and new networks, they experience a heightened sense of agency, though expressed differently across contexts. As a woman in a monogamous, nuclear household in peri-urban Bangalore noted:

*Absolutely, the change in me happened because of my working. Earlier I was afraid of going alone to the next street. I needed my husband's support even to go to my mother's place. Now I go there alone, changing two three buses (Poonacha, Rai Chowdhury, & Kaur, 2018).*

Such agency needs to be distinguished from wellbeing outcomes, as in stressed environments in particular, diversification could end up increasing women's work burdens, leaving them with less time for leisure (Arku & Arku, 2010; Djoudi & Brockhaus, 2011; Cole et al., 2013). This is seen in much of South India where men are increasingly commuting long hours for work, leaving livestock and farm work to women. While this can be seen as a cooperative division of responsibilities for expected gains made from commuting, women respondents noted that farm and livestock chores had become more difficult in the context of climate variability. Social norms around women working outside the village and lack of appropriate skills meant these women, especially those who were older, were unable to explore new strategies with the potential to strengthen adaptive capacities and contribute towards adaptation (Singh, 2019a).

In Lawra and Nandom Districts of Ghana, increasing rainfall variability, combined with limited non-agricultural livelihood opportunities, have led households to invest in irrigation, crop diversification and intercropping, with only few farmers resorting to migration (c.f. Ahmed et al., 2016; Nyantakyi-Frimpong & Bezner-Kerr, 2015). Women in these communities are now engaged in additional livelihoods such as groundnut farming, the sale of locally manufactured drinks, shea and groundnut processing, basket weaving and petty trading. This disproportionately increases their overall work burdens relative to the returns (Lawson, Alare, Salifu, & Thompson-Hall, 2019). Further, in Kenya, gender-segregated labour markets have meant that women are often exposed to risky and precarious working conditions, including engagement with casual sex-work, to meet the pressures of survival (Rao, 2019). A 35-year-old abandoned woman with two children said:

*I knew I was HIV positive when I got pregnant with my first child. My husband left me when he found out, so I moved back to Isiolo and started selling miraa [a chewable stimulant] at night. My*

*customers are mostly men, so when the business was not good, I started having sex for money, I had to bring up my child somehow.*

While diversification is critical to coping and survival (Adams et al., 1998), the outcomes are not always positive as these are shaped by women's (and men's) social locations within the household and community and the opportunities this offers (Shipton, 1990; Flatø et al., 2017). While for younger women in nuclear, monogamous households, diversification contributed to an expansion of their agency and autonomy, for older married women, it increased their work burdens, and for separated or abandoned women, their exposure to health risks.

#### 4.2. Migration

Migration is a key livelihood strategy in semi-arid areas (Djoudi et al., 2012; Singh & Basu, 2019). People identified migrating for a range of reasons and while climate change is not the sole driver, it is increasingly mediating other drivers (Bardsley & Hugo, 2010; Adger, Arnell, & Black, 2015; World Bank, (2018), 2018; Singh et al., 2018b). In combination with changing aspirations, labour demand dynamics, local conflicts etc., climatic factors can prove to be tipping points.

Across the research sites, temporary, seasonal, and permanent migration and commuting (daily travel over long distances) in search of formal and informal jobs, are common strategies. The nature of this movement and destination varies (Table 3), based on local socio-ecological contexts and livelihood opportunities available to particular types of households. For example, in Karnataka (India), whereas previously men and women from Scheduled Caste and Muslim communities would travel together to neighbouring villages as agricultural labourers, now men tend to migrate to cities while women stay at home or enter factory jobs based on availability and proximity.

Typically, across all our research sites, men migrated more than women. When women migrated, it tended to be with their families, although some Ethiopian women had migrated alone before marriage. Migration was facilitated by social networks, where someone who had migrated from the same community/village helped others find jobs and settle into destination areas, whether it be urban or peri-urban settlements or other rural areas. This gendered nature of movement was a function of social norms (e.g. in India, Ghana), security issues (e.g. in Mali), and availability of appropriate work (e.g. in India, Kenya). Further, age mattered. While both young men and women tended to migrate in Ethiopia and Namibia, older women engaged mainly in informal trade or service provision and older men tended to invest in traditional livelihoods such as moving for seasonal grazing or in search of new pastures. The implications on household dynamics and wellbeing varied in each instance (Table 3).

Migration contributes to household risk management through remittances as well as the flows of ideas and technologies (International Organization for Migration, 2015; World Bank, 2018), yet its impact on increasing adaptive capacity is mixed (Ober, 2014; Bettini, Nash, & Gioli, 2016; Singh & Basu, 2019; World Bank, 2018). Remittances can buttress households against shocks and result in higher investments in health, food security and access to sanitation (Szabo, Adger, & Matthews, 2018), yet such investment depends on who receives the remittance. Where senior men/women, especially in polygamous households, as in Mali, receive the remittance money, it may not contribute equally to meeting the needs of all members of the household (c.f. de Haan et al., 2000). In monogamous households, where the wife directly receives the money, outcomes are clearer (c.f. Hamilton, Dewalt, & Barkin, 2003). Yet even here, left behind wives may have increased and new responsibilities, without necessarily greater

**Table 3**  
Nature of migration across research locations.

Site	Type of movement	Drivers	Implications on household dynamics, wellbeing
Ghana	Both young men and women seasonally migrate to southern Ghana after the farming season for other livelihood opportunities	During lean periods there is no work available in villages	Coping strategies to support household food security
Mali	Young men and women migrate to traditional mining sites and neighbouring communities for other livelihood opportunities	Environmental stress and lack of alternative livelihood opportunities	Coping strategies to support household income and food security. But increases burden for elder people left behind
Ethiopia	Seasonal migration to individual and family-based pasture, 'commuting' to peri-urban areas (sugar plantations), and migration to Djibouti and urban centres. Reverse migration where children sent back to the villages while parents work or to support elders, who may play an important role in holding family livestock	For education, employment or to preserve livestock	Children are able to continue education for longer, livestock remain healthy, migrants are sometimes able to remit to support their households (sometimes the reverse occurs), and migrant households are able to support their natal families
Kenya	Seasonal movement with livestock, seen more in terms of pastoralism than migration. Only few young men migrate to towns in search of casual work and women post-marriage	Lack of herds is pushing young men to move in search of work, and for some, for education	Breakdown of marital contracts, with men and women fending for themselves; persistence of polygamy and multiple relationships, with potential health risks
Namibia	Seasonal movement of male pastoralists seen more in terms of historical mobility patterns to cattle posts. Rural-urban migration within the region or elsewhere in Namibia. Permanent migration is mainly among young men and women for tertiary education and employment in cities and towns. Younger women mainly engaged in informal trade	For education, employment or to preserve livestock	The average age of the household and proportion of older adults and children has increased. Migrant youth send remittances. Increase in reciprocal arrangements. Men are expected to contribute more when the household is facing food shortages
India	Commuting, seasonal and permanent migration. In Kolar, commuting is facilitated by good road and train connectivity. In TN, weekly commuting for blue-collar jobs. Migration type strongly determined by location and social networks	Recurrent droughts, water scarcity, reducing returns from farm livelihoods, land fragmentation, youth aspirations away from farming	Less exposure to climatic risks in the rural but increased exposure to new risks in the urban such as localised flooding. Although material wellbeing increased, women reported less leisure and increased work burdens after moving to the urban. Women and elderly left in villages also had to take on extra work and new roles

**Table 4**  
Select wellbeing indicators.

Case study	Material (regularly skipped a meal)	Relational (Social cohesion/conflict)	Subjective (Life satisfaction)
Karnataka, India (n = 825)	26% FHH 14% MHH	74.5% households relied on social networks such as Self Help Groups, cooperatives, religious groups and political parties during distress	No difference between MHH and FHH
Tamil Nadu, India (n = 415)	5.2%	20% borrowed from relatives	84% of Scheduled Caste and Scheduled tribe MHH reported that they were unsatisfied with their farming practice.
Ghana (n = 420)	79% households food insecure	N.A	Same for MHH and FHH
Namibia (n = 286)	27% FHH 19% MHH	N.A	FHH experienced lower life satisfaction – only 20% of FHH reported being satisfied vs. 27% MHH
Mali	9% rural 7% urban	31% sought help from parents/friends	No data
Kenya (n = 297)	25–30% Borana; 50% Meru 6.35% married monogamous. 5.26% separated, 3.23% widowed	85% involved in conflict in mixed ethnic village, and 50% in single ethnic village 31.5% married polygamous have conflict over resources; 64% married monogamous, 60% separated	60% Boranas, 20% Merus 17% married polygamous 8% widowed, 5% married monogamous reported being satisfied with life
Ethiopia (n = 295)	56% households	As community ethnically homogenous, varied by occupation: 36% of those in casual labour engaged in conflict, 18.46% of farming, 9% pastoralism	76% said situation was worse than before Hired labour most satisfied with education compared to other groups

Source: Household surveys.

control over incomes (Rao, 2012a, 2012b; Mueller, Kovarik, Sproule, & Quisumbing, 2015; Bhattarai et al., 2015, Singh, 2019a). Precarious, unsafe working conditions in destination areas for both young men and women could further negatively affect their own wellbeing (Bhagat, 2017).

#### 4.3. Changing agricultural practices

Climatic variability has driven different responses in terms of dependence on agriculture across our study sites. While in India, one finds a shift away from agriculture, at least aspirationally, in



West Africa, people are making serious attempts to adjust agricultural practices in response to climate variability and change. In both contexts, agriculture remains a fall-back, and is increasingly feminised.

A study of woman groundnut farmers in Lawra and Nandom districts of Ghana found them adopting both on-farm and off-farm strategies to manage risk. They had changed their planting dates to adapt to changes in rainfall patterns, adopted early maturing varieties, and taken to livestock rearing and manure application. None of the respondents practiced irrigated farming, rainwater harvesting or drought insurance due to their cost implications. However, the uptake of these strategies varied by gender, marital status, residential status, education and age. For example, younger farmers (56 per cent, includes both male and female) were more likely to engage in off farm activities, and farmers who borrowed lands (62 per cent and predominantly women) were more likely to adopt early maturing crop varieties of groundnuts, mixed cropping and composting. Married women, with land access through their husbands, seemed to have more options compared to single and widowed women farmers as patriarchal norms limit women's access to inheriting or owning lands (Rademacher-schulz, Schraven, & Mahama, 2014; Nyantakyi-Frimpong & Bezner-Kerr, 2015; Ahmed et al., 2016; Rao et al., 2017). Women's work burdens had generally increased, and for some married women in these districts this negated gains in decision-making (Salifu, Lawson, & Wrigley-Asante, 2016).

In India, we observed growing disinterest in agricultural livelihoods due to water scarcity (Singh et al., 2018b), and sale of farm land for real estate development (Poonacha et al., 2018). Where farming persists, pests, unstable markets, and increase in extreme events, have driven farmers (typically large, upper-caste, male-headed households) away from dryland food and fodder crops (millets) towards cash crops (vegetables, tobacco, floriculture etc.). These are accompanied by changes in farm management practices including increase in mechanization, use of fertilizers and pesticides, and irrigation. Increasing demands on groundwater for irrigation has impacted the groundwater table in the region, with different implications for access by gender, class and caste position (Solomon & Rao, 2018). In Bhavani (Tamil Nadu, India), farmers are also diversifying crops to spread risks; growing up to six different crops in four acres of land in one season. Increase in cash cropping and crop diversity has increased farm labour demands pushing more women into unpaid agricultural labour in their homestead. While women's responsibilities and work burdens on the farm and within the household have increased, men are more open to sharing domestic work including the provisioning of domestic water, especially in nuclear, monogamous households. The position of widowed women here is extremely vulnerable given their lack of secure access to land (Ibid.).

The choice of strategy, whether shifting cropping practices (change in crop timings in Bhavani), diversifying crop varieties (Kolar and Bhavani), opting for early maturing crops (Ghana or Namibia), or the shift to small ruminants (amongst pastoralists in Kenya and Ethiopia), is shaped by the nature of the household and its social location. These have impacts both for ecological sustainability in the long run, for instance, through groundwater depletion (Singh et al., 2018b), and wellbeing outcomes, in terms of diets, work burdens or control over incomes.

#### 4.4. Social support mechanisms

Social support systems at different scales – household, kinship, community and state – strongly mediate risk management in complex and multiple ways (Pelling & High, 2005; Petzold & Ratter, 2015; Rao et al., 2019b, in press). Most adaptation studies seek to understand social support systems through a social capital lens,

concentrating on features of social life (networks, relations, trust and norms) that enable men and women to act together or form relationships that enhance agency and their capacity to respond to climate risks (Adger, 2001, 2003; Prasad, Helfrich, & Crate, 2009; Lockwood et al., 2015). These are characterized as either bonding ties, based on family and kinship relations, friendship and locality or bridging ties which tend to work through external links such as migrant networks (Adger, 2003).

In our research locations, community-based support systems are crucial for survival, as public services are not easily available. In northern Kenya, with persistent drought, communities have realised the importance of some cooperation, and men, especially those with livestock, are attempting to rebuild systems of accountability at the local level. Of course, these decision-making structures are dominated by the wealthy and the elderly, and exclude the youth and those without resources. Frustration and resentment amongst young men here has implications for gender relations and household wellbeing more broadly. They leave homes in search of employment, but often end up engaging in drugs or violence. Younger women are no longer willing to invest in marriages to such men, and instead prefer to invest in strengthening relationships with their female, matrifocal kin, mothers and aunts. They would potentially share their domestic tasks alongside responsibilities for provisioning, explaining why female-headed households might be on the rise. 25-year-old Bira noted:

*My mother sells miraa in the market and from her earnings buys food for us. I have a small kiosk outside our house. I bought the goods and my mother helped construct the structure. Yet my sales are low, so I mainly take care of the children and domestic work (Rao, 2019).*

With marriage becoming less secure, for women too, apart from kin, other social networks, including self-help groups (SHGs), are gaining importance. Amongst the agro-pastoral Meru community in Kenya we studied, state initiatives have led to the organisation of over 100 SHGs, each with 10–20 members. They meet every Thursday afternoon in the compound of the local school, and engage with both savings and credit activities. For many women members, this is a major form of support. Amongst the pastoralist Boranas, such forms of credit have not yet gained ground.

In north-central Namibia, bonding social capital varies with ethnicity and is stronger amongst the minority groups as compared to the majority Kolonkadhi community. Bridging social capital, however, is limited to the one-way relationship with the state, wherein the community expects to receive drought relief from the state as part of its obligations to its citizens. Interestingly, it was the minority Dhemba ethnicity, and particularly households headed by divorced women who relied most on drought relief, while the majority community looked for support in terms of agricultural services. Furthermore, the state offers social pensions for the elderly (60 years and above) and grants for disabled, vulnerable and orphan children (Angula, 2019). It is worth noting that State interventions focusing on poverty alleviation, strengthening livelihoods, and providing social safety nets do support household risk management strategies. In India many respondents spoke of the national employment guarantee scheme and subsidized food rations helping cope during droughts. In Ethiopia too, state transfers in terms of food aid and credit are central elements of household coping with persistent drought (Camfield, Leavy, Endale, & Tefera, 2019, in press).

#### 5. Wellbeing outcomes

Across the sites, responses to climate change (Sections 4.1–4.4) had implications for household wellbeing and adaptive capacity.



As discussed in [Section 2.3](#), these responses had multiscale outcomes for individual and household wellbeing and local adaptation. For example, strategies such as migrating affect individual and household material and subjective wellbeing through increased income from remittances, changes in intrahousehold labour divisions, and typically reduced leisure time, especially for women. Responses such as changing agricultural practices towards more cash crops in India improve material wellbeing through higher agricultural incomes but often see simultaneous groundwater over extraction and heavy use of chemical fertilisers, thereby undermining local natural resources and adaptive capacity. They also intensify the contribution of women's unpaid labour to family farms. We discuss wellbeing outcomes in the following [Sections \(5.1–5.3\)](#), drawing on our survey data where possible.

### 5.1. Material wellbeing: a focus on food/nutritional security

While material wellbeing can be estimated through a range of measures as noted in [Section 2.3](#), here we focus on food and nutrition security ([Table 4](#)). Both livelihood diversification and changing agricultural practices have implications for household consumption patterns and food security. While state social protection such as the Public Distribution System in India or food aid in Ethiopia ([Section 4.4](#)), has ensured basic food security, a move towards cash crops in both these contexts ([Section 4.3](#)) has paradoxically reduced the nutritional content of household diets. For example, in India it has shifted consumption from nutrient-rich millets and vegetables to the less nutritious polished rice as the main staple ([Solomon & Rao, 2018](#)). In Namibia too, a decline in crop diversity is impacting nutritional diversity.

Across the study sites, dairy and protein consumption has reduced, affecting the quality of the household diet. This is largely attributed to the decrease in large-scale cattle ownership in both regions and increasingly frequent droughts. In pastoralist communities in Ethiopia and Kenya, households perceived a reduction in the availability of milk and meat due to decreasing herd sizes and a shift to small ruminants. They observed that their children were visibly less well-nourished as a result. Haye Hamid, an older polygamous male pastoralist in Ethiopia said 'look at those boys [lifting the arm of a child] – when I was young we have enough milk and we are fat and strong. Look at those children, they are thin'.

While we did not collect food diaries or precise information on food intakes, there is considerable evidence to suggest distributional biases within and across households ([Miller, 1997; Harriss-White, 1997](#)). In both the Indian sites and Namibia, female headed households appear to be more food insecure than male headed households, with a higher proportion skipping meals regularly ([Table 4](#)). In most of the African sites, a majority reported being food insecure, but even here, we find subtle differences, with monogamously married women in Northern Kenya skipping meals more frequently than those separated or widowed. This points perhaps to the social pressures they face in performing their gender roles as good mothers and wives.

The playing out of intra-household power dynamics was particularly visible in our research in Koutiala district of southern Mali, where rural young women are key to the household food security system. They pound millet, do field labour, collect water and firewood, and generate income (through commerce and off-farm jobs). Yet, the patriarchal and polygamous nature of traditional Malian society can limit their decision-making power and affect their ability to carry out their designated tasks. For instance, as elder men control the use of farm equipment, young women must sometimes do their farm work by hand: "Weeding [by hand] is painful", said one young woman. Also, although young women must prepare food for the household, it is older women, often senior wives,

who decide what food should be prepared and how it should be distributed. These factors make young women/junior wives (and by extension children, who are largely under their care) more vulnerable to the challenges of food insecurity than other demographic groups ([Rivers et al., 2017](#)).

A final point relates to women's own health and wellbeing. A feminization of responsibility ([Olsson, Opondo, & Tschakert, 2014](#)) due to migration has impacted the gender division of labour, with women within rural households taking on both caregiving and earning duties, often single-handedly. While some women have gained decision-making agency, with enhanced mobility and autonomy ([Section 4.1](#)), for others, their need to survive has led to actions that impinge on their leisure time, with potential negative implications for their own health and child health and nutrition ([Shankar, Nagasree, & Sankar, 2013; Bhattarai et al., 2015; Rao et al., 2019](#)).

Contexts of stress then appear to have contradictory and variable effects on women's agency and material wellbeing, shaped equally by their class position and the type of household of which they are a part, and its norms of sharing and support. In West Africa, while older women exercised high levels of agency and responsibility in ensuring food security in Mali, in the case of Ghana they had lost out in terms of decision-making and resource access and control at both the household and community levels. Similarly, in India, women were virtually excluded from controlling productive assets and making decisions in one semi-arid community, while in a neighbouring area, in a context of high male migration, they tended to have a greater role in decision-making. Cooperation between women within and across households seems key to improving agency as well as material wellbeing, as noted by Bira ([Section 4.4](#)).

### 5.2. Relational wellbeing

Risk management strategies are clearly disrupting and rebuilding relationships at the household level and between kin-groups and communities. They are also reformulating expectations from the state.

#### 5.2.1. Household structures and intra-household dynamics

In [Section 2.1](#), we noted the increase in female-headed households across most of our study sites. But it is not just a change in headship; we find households are increasingly more complex, stretching across locations and generations. Nuclear households are seen as more conducive to equitable gender relations than joint households, especially in a context like India ([Coffey, Khera, & Spears, 2016](#)), yet this can no longer be assumed. While stress and scarcity can enhance women's agency, this can also have a dampening effect on their wellbeing through increased work burdens and lack of leisure time. In Kenya, as in the case of food security noted above, women married in monogamous households noted a higher level of conflict and less improvement in their own lives in relation to others, while those in polygamous households reported the opposite. While we are unable to pinpoint the seniority of the wife interviewed, several insights from our qualitative research could explain these responses. Polygamous men are generally better off, with access to resources, and are obliged to provide their wives with capital to set up her own enterprise. With some independent income, wives often feel more secure and able to have a say in the relationship.

Different forms of cooperative relationships are visible across our case studies. In Kenya, as noted in [Section 4.4](#), younger women are opting out of marriage, in favour of forming new types of households, often with their mothers and sisters, or other matrilineal kin ([Rao, 2019](#)). In Ethiopia, we find households stretching across multiple locations in order to make a living – members



engage in herding, farming, trade, or other forms of employment – exchanging food and cash as needed (Camfield et al., 2019, in press). For example, a widow, who moved to Awash town, Ethiopia, on her own to work in a cotton factory while leaving her children with family near Awash Arba, now sells coffee on the main road into town. Due to rising sugar prices, she says that instead of remitting money, she relies on small, ad hoc amounts from her elder son when he sells one of the male goats she left with him. These examples challenge our notion of the household as a nuclear unit. They also challenge our assumptions around intra-household negotiations, as these are no longer restricted to couples. Households are increasingly multi-generational and multi-locational with new forms of cooperation and indeed conflict developing amongst them.

### 5.2.2. Extra-household, community level dynamics

Community dynamics are influenced by trust and reciprocity between different members of the community (Pretty, 2003; Pelling & High, 2005) as well as the state in its provisioning of social protection. In fact, where the state is dysfunctional or absent, men and women in the community have no choice but to support each other (Adger, 2003). In Northern Kenya, we found a revival of community institutions to manage pastures amongst the pastoral communities, alongside a strengthening of household relations especially “mother-daughter” and “father-son” relationships. State support here was seen as tokenistic (Rao, 2019). In Ethiopia, even urban Afar depended on kin networks and traditional social networks, in the relative absence of state support.

In north-central Namibia, community relations create cohesion and unity within ethnic groups and extended families. The strength of these relations, however, differ across ethnicities. For instance, the Ndongona ethnic group is a minority and displays much stronger social cohesion compared to the majority Kolonkadhi. The Kolonkadhi ethnic group value their neighbours and friends more than kinship relations. In focus group discussions, they noted:

*A good friend with trustworthy qualities, a good neighbour who can help you when in need and who allows you to share and exchange resources to maximize production are important for managing risk (Angula, 2019).*

In south India, we found that increasing out-migration is eroding community-level cooperation with negative implications on management of common natural resources such as pasturelands and village ponds and also shifting gender divisions of labour for livestock maintenance and farming, with greater stress on women's time (Singh, 2019b).

### 5.3. Subjective wellbeing and changing aspirations

In terms of satisfaction with life as a whole, people reported being either not satisfied or moderately satisfied, with differences by age, gender, caste/ethnicity and marital status (Table 4). In Tamil Nadu, India, men from the Schedule Caste and Scheduled Tribes reported lower levels of satisfaction, associated with the low productivity of rainfed farming systems in comparison to the larger, irrigated farming systems of farmers from Other Backward Castes. In Kenya, life satisfaction varied between ethnicities, 60 percent of Boranas expressed overall satisfaction with their lives compared to 20 percent of other ethnic groups such as Merus, who felt discriminated against in the receipt of state support, including drought relief. Married polygamous women appeared more satisfied than other categories, though even widowed women reported higher levels of satisfaction vis-a-vis monogamously married women. One explanation comes from a focus

group with young women in the peri-urban settlement, who appeared resentful that their parents withdrew them from school. As one of them said, *‘they took the bridewealth and sold us’* into marriage. They are entirely dependent on their husbands and often humiliated when they ask for money, even for setting up an enterprise. They felt they had sacrificed their lives for marriage – their husbands could not provide adequately, neither did they have the freedom of an unmarried woman (Rao, 2019).

Changing aspirations were a critical driver of individual and household responses but also an outcome of certain strategies. Across our research sites, many aspirations revolved around the education of children. In Namibia, all households interviewed indicated that they value education highly; they noted education is the future because subsistence farming cannot fully sustain families. According to Comfort, a married woman in Lawra District, Ghana:

*Our dreams and aspirations for the future are to see our kids educated and become better off than they are today so they can take care of us in future.*

The above quote touches upon the intergenerational aspect of aspirations and how meeting them through another generation is seen as achieving ‘success’. In the context of research that shows psychological aspects are critical to individual adaptation (Mortreux & Barnett, 2017; Singh, Osbahr, & Dorward, 2018a), such insights are important to understand why people invest in or choose to undertake certain responses. In fact, at times, pursuit of these aspirations can also lead to conflict, as was evident in Northern Kenya.

Second, rural to urban migration (Section 4.2) has shaped aspirations towards improved access to schools, better-paying jobs, and better lifestyles. In Ethiopia, while aspirations for children's education and employment were universal, adult aspirations were framed around moving to town and some planned to develop businesses in peri-urban and urban areas. For example, one young woman in a monogamous marriage living in a peri-urban area talked about opening a shop in the future as ‘it's not difficult to do... shops are more profitable’. However, across our research sites, these expectations were not always met: livelihood options in urban areas were often reported as few and difficult to enter, wage labour was precarious, and living conditions poor.

Third, many aspirations were around improving current and future business opportunities in agriculture and non-farm livelihoods. Across our sites, women in particular aspired to access loans to expand their businesses. However, as loans come with the risk of debt, these aspirations often meant short-term gains could lock families into longer-term poverty or debt traps. In Namibia, members of the minority community also discussed the need for improved water supply for irrigation to meet their aspirations of scaling up or starting horticultural farming to supplement their incomes.

## 6. Discussion and conclusion

### 6.1. Changing gender relations, women's agency and adaptive capacity

As discussed so far, not only do household dynamics influence strategies for managing risk and adaptive choices, these also shape gender relations within and beyond the household, and in turn wellbeing outcomes. While this paper has discussed trends specific to people from the study sites, they represent similar situations of dynamic change reported in other climate hotspots (Rao, Gazdar, Chanchani, & Ibrahim, 2019a).

Across our study sites, we find that gender divisions of labour are shifting, with women taking on more responsibility for managing household production, traditionally male activities, and

household reproduction. Yet, gendered norms around what is socially appropriate or not shape the choices available to women and men within households, and these in turn are shaped by their specific social positions within their households and communities. While gender analysis has focused on differences between men and women, and within each of these categories, we found the structure and composition of the household playing a significant part in intra- and inter-household negotiations, with a bearing not just on the exercise of agency, but equally wellbeing outcomes. Social norms do restrict the choices available to women, yet the opportunities available to them are shaped both by the context and the quality of relationships in which they are embedded. In urban and peri-urban contexts, for instance, women are experimenting with new enterprises and forms of employment, yet these options can only be pursued if they are supported by a degree of reciprocity and mutuality within the household. The mixed effects of risk response strategies implies the need to think about the household beyond conjugal or spousal relationships, to those across generations and locations.

What is also significant is that improved agency and decision-making abilities have not necessarily improved women's wellbeing. One finds significant trade-offs between women's work, health, and their aspirations for their children. While women are calling into question the conjugal contract, the nature of the household and their rights and obligations therein, they are nevertheless exercising agency in ways that may harm their own health and wellbeing. Their personal wellbeing is discounted in favour of the long-term security they hope to see through the successes of their children. This disconnect between agency and wellbeing was implicit in our hypothesis, but emerged clearly from the data.

## 6.2. Implications on wellbeing and adaptation

In tracing household and intra-household risk management to explore outcomes for wellbeing and adaptation, we found that

while most risk management strategies improve material wellbeing, implications on relational and subjective wellbeing and adaptive capacity are mixed, as discussed in Section 5 (Table 5). Outcomes differed across type of response strategy, different types of households and the support mechanisms they offered, and across individual, household, and community scales. Our approach highlights that women and men are managing climatic and non-climatic risks in ways that secure survival; current strategies still fall short on meeting personal aspirations and building local adaptive capacity. This is critical to recognise and plan for, especially in resource-scarce and highly dynamic climate hotspots (Ford, Berrang-Ford, & Bunce, 2014; Kilroy, 2015) such as semi-arid regions, where short-term economic survival strategies can often undermine ecological sustainability as seen in rapid groundwater depletion, or social wellbeing reflected in declining nutritional and health outcomes, in the long run. Table 5 summarises the four response strategies examined across the sites and their implications for wellbeing and adaptive capacity.

Understanding household dynamics, across gender and generation, as we have sought to do in this paper, holds implications for adaptation policy and practice in several ways. First, policy- and decision-making processes are rarely, if ever, designed to consider people's lived realities, and their changing nature. Moreover, there is a gap in acknowledging structural gender differences – the case in Karnataka, India showed how men and women both aspired to move out of farming but young women had less opportunity to act upon this than young men. In places where farming livelihoods persist, efforts must be made to make agriculture attractive to the youth. This can be done in various ways, for example enhancing water and land stewardship or providing sufficient credit to young farmers, both women and men, for longer-term investment. At the same time, other safe and remunerative non-farm opportunities need to be developed and strengthened.

Second, focussing on how household dynamics are changing can give us insights into understanding why people are adapting

**Table 5**  
Implications of risk management strategies on wellbeing and adaptive capacity.

Outcomes Risk management strategies	Material wellbeing	Relational wellbeing (household structures, intra-household dynamics, social cohesion)	Subjective wellbeing (perceptions of satisfaction, aspirations)	Implications on local adaptive capacity
Livelihood diversification	Typically, diversification tends to increase material wellbeing of the entire household through increased incomes	Relational wellbeing outcomes depend on livelihood type diversified into. Where women enter non-agrarian livelihoods, agency and bargaining power increases but so do work burdens	Depending on livelihoods diversified into, men and women's work burdens and consequent time for leisure change	Tend to increase adaptive capacity through increases in income and risk spreading
Migration	Increased household material wellbeing through higher income and remittances	Changes household structures especially headship when men out-migrate. Intra-household dynamics shift with increased work burdens on women (both those who migrate and well as those left behind). Decreased social cohesion with implications for communal ties, collective resource management	Subjective wellbeing outcomes were heavily gendered with migrant women reporting higher agency but increased work burdens	Can increase adaptive capacity when remittances are significant, potentially negative longer-term impacts such as lower investments in farming, exposure to new risks in destination areas
Changing agricultural practices	Increased income from agriculture, especially when shifting to cash crops, has impacts on purchasing power and food security. Somewhat negative impact on nutritional security as shift away from local, nutrient-rich crops	Changes in work burdens and decision-making, with cash crops typically being 'male crops', also undermine social cohesion (e.g. competitive borewell drilling in Bhavani, India)	Increased satisfaction due to higher agricultural income	Negative impacts include growing more climate sensitive crops such as flower and horticulture species, longer-term maladaptive impacts through reliance on input-heavy crops
Support mechanisms	Increased material wellbeing through sharing resources and labour, alongside growing conflict and competition	Informal and formal support can enhance time available for production and reproduction, and also create new forms of exclusion	Satisfaction as able to act towards fulfilling aspirations; and frustration due to breaking relationships	Increase capacities to deal with shocks, where more cooperation and support



or not. Without understanding people's aspirations and imaginings for the future, and indeed their time horizons and time preferences, it is hard to understand why they make some choices and not others. This is particularly true for young women, often overburdened with responsibilities, yet with access to few resources that can enable them to meet these adequately. Such an analysis can suggest entry points into what can work – projects focusing on both young women and men as agents of change to challenge social norms and patriarchal traditions, providing skill-appropriate opportunities for young women, along with investments in supportive infrastructure especially childcare, health and education facilities – to increase the range of adaptation possibilities available to them.

Finally, an understanding of household dynamics and movements, that households are multi-locational, multi-generational, and not just nuclear, can help improve the targeting of social protection and other mitigation programmes. It also has implications for the ways in which support is given and social capital built. What holds for one group or community, may not hold for another, so it becomes important to understand contextual specificities, rather than assuming that communities experience the impacts of climate and other changes in the same ways. This would involve consultations with different groups, not just the dominant men, in making climate adaptation plans, and building effective collectives to address issues of climate change.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### References

- Adams, A. M., Cekan, J., & Sauerborn, R. (1998). Towards a Conceptual Framework of Household Coping: Reflections from Rural West Africa. *Africa J. Int. African Inst.*, 68, 263–283.
- Adger, W., Arnell, N., Black, R., et al. (2015). Focus on environmental risks and migration: Causes and consequences. *Environmental Research Letters*, 10, 60201. <https://doi.org/10.1088/1748-9326/10/6/060201>.
- Adger, W. N., Brown, L., & Surminski, S. (2018). Advances in risk assessment for climate change adaptation policy. *Philosophical Transactions of the Royal Society A*, 376(2121), 20180106.
- Adger, N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). Adaptation to climate change in the developing world. *Progress in Development Studies*, 3(3), 179–195.
- Adger, W. N. (2001). *Social capital and climate change* Tyndall Centre Working Paper No. 8. Norwich, UK: Tyndall Centre for Climate Change Research.
- Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, 79, 387–404.
- Ahmed, A., Lawson, E. T., Mensah, A., et al. (2016). Adaptation to climate change or non-climatic stressors in semi-arid regions? Evidence of gender differentiation in three agrarian districts of Ghana. *Environmental Development*, 20, 45–58. <https://doi.org/10.1016/j.envdev.2016.08.002>.
- Ahmed, S., & Fajber, E. (2009). Engendering adaptation to climate variability in Gujarat, India. *Gender and Development*, 17, 33–50. <https://doi.org/10.1080/13552070802696896>.
- Andersson, E., & Gabriellson, S. (2012). 'Because of poverty, we had to come together': Collective action for improved food security in rural Kenya and Uganda. *International Journal of Agricultural Sustainability*, 10, 245–262. <https://doi.org/10.1080/14735903.2012.666029>.
- Angula, M. (2019). *A gendered and intersectional analysis for understanding vulnerability to the changing climate within socially diverse communities in Semi-arid Regions*. North-Central Namibia: University of Cape Town.
- Antwi-Agyei, P., Quinn, C. H., Adiku, S. G. K., Codjoe, S. N. A., Dougill, A. J., Lamboll, R., & Dovie, D. B. K. (2016). Perceived stressors of climate vulnerability across scales in the Savannah zone of Ghana: a participatory approach. *Regional Environmental Change*, 1–15. <https://doi.org/10.1007/s10113-016-0993-4>.
- Appadurai, A. (2004). The capacity to aspire: Culture and the terms of recognition. In V. Rao & M. Walton (Eds.), *Culture and public action* (pp. 59–84). Palo Alto, California: Stanford University Press.
- Arku, F. S., & Arku, C. (2010). I cannot drink water on an empty stomach: A gender perspective on living with drought. *Gender and Development*, 18, 115–124. <https://doi.org/10.1080/13552071003600091>.
- Armitage, D., Béné, C., Charles, A. T., et al. (2012). The interplay of well-being and resilience in applying a social-ecological perspective. *Ecology and Society*, 17. <https://doi.org/10.5751/ES-04940-170415>.
- Arora-Jonsson, S. (2011). Virtue and vulnerability: Discourses on women, gender and climate change. *Global Environmental Change*, 21, 744–751. <https://doi.org/10.1016/j.gloenvcha.2011.01.005>.
- Bardsley, D. K., & Hugo, G. J. (2010). Migration and climate change: Examining thresholds of change to guide effective adaptation decision-making. *Population and Environment*, 32, 238–262. <https://doi.org/10.1007/s11111-010-0126-9>.
- Barrett, C. B., Barnett, B. J., Carter, M. R., et al. (2007). Poverty traps and climate risk: Limitations and opportunities of index-based risk financing. IRI Technical Report No. 07-02. 56.
- Belay, A., Recha, J. W., Woldeamanuel, T., & Morton, J. F. (2017). Smallholder farmers' adaptation to climate change and determinants of their adaptation decisions in the Central Rift Valley of Ethiopia. *Agriculture and Food Security*, 6, 1–13. <https://doi.org/10.1186/s40066-017-0100-1>.
- Below, T. B., Schmid, J. C., & Sieber, S. (2015). Farmers' knowledge and perception of climatic risks and options for climate change adaptation: A case study from two Tanzanian villages. *Regional Environmental Change*, 15, 1169–1180. <https://doi.org/10.1007/s10113-014-0620-1>.
- Bettini, G., Nash, S. L., & Goli, G. (2016). One step forward, two steps back? The fading contours of (in)justice in competing discourses on climate migration. *The Geographical Journal*. <https://doi.org/10.1111/geoj.12192>.
- Bhagat, R. (2017). *Migration, gender and right to the city*. Economic and Political Weekly.
- Bhatta, G. D., Aggarwal, P. K., Poudel, S., & Belgrave, D. A. (2015). Climate-induced migration in South Asia: Migration decisions and the gender dimensions of adverse climatic events. *Journal of Rural Community Development*, 10, 1–23.
- Bhatta, G. D., & Aggarwal, P. K. (2016). Coping with weather adversity and adaptation to climatic variability: A cross-country study of smallholder farmers in South Asia. *Climate and Development*, 8(2), 145–157. <https://doi.org/10.1080/17565529.2015.1016883>.
- Bhattarai, B., Beilin, R., & Ford, R. (2015). Gender, agrobiodiversity, and climate change: A study of adaptation practices in the Nepal Himalayas. *World Development*, 70, 122–132. <https://doi.org/10.1016/j.worlddev.2015.01.003>.
- Bird, K. (2007). *The intergenerational transmission of poverty: An Overview* ODI Working Paper 286. London: Overseas Development Institute.
- Bowles, S., Gintis, H., & Groves, M. O. (2005). *Unequal Chances: Family Background and Economic Success*. Russell Sage Foundation. New York and Princeton University Press: Princeton.
- Brown, K., & Westaway, E. (2011). Agency, capacity, and resilience to environmental change: Lessons from human development, well-being, and disasters. *Annual Review of Environment and Resources*, 36, 321–342. <https://doi.org/10.1146/annurev-environ-052610-092905>.
- Bryan, E., Ringler, C., Okoba, B., et al. (2013). Adapting agriculture to climate change in Kenya: Household strategies and determinants. *Journal of Environmental Management*, 114, 26–35. <https://doi.org/10.1016/j.jenvman.2012.10.036>.
- Bunce, A., & Ford, J. (2015). How is adaptation, resilience, and vulnerability research engaging with gender? *Environmental Research Letters*, 10. <https://doi.org/10.1088/1748-9326/10/12/123003>.
- Bryan, E., Deressa, T. T., Gbetibouo, G. A., & Ringler, C. (2009). Adaptation to climate change in Ethiopia and South Africa: options and constraints. *Environmental Science and Policy*, 12, 413–426. <https://doi.org/10.1016/j.envsci.2008.11.002>.
- Camfield, L., Leavy, J., Endale, S., & Tefera, T. (2019). 'People who once had 40 cattle are left only with fences': Coping with persistent drought in Awash, Ethiopia. *European Journal of Development Research* (in press).
- Caretta, M. A., & Börjeson, L. (2015). Local gender contract and adaptive capacity in smallholder irrigation farming: A case study from the Kenyan drylands. *Gender, Place and Culture*, 22, 644–661. <https://doi.org/10.1080/0966369X.2014.885888>.
- Carr, E. R., & Thompson, M. C. (2014). Gender and climate change adaptation in agrarian settings: Current thinking, new directions, and research frontiers. *Geographical Compass*, 8, 182–197. <https://doi.org/10.1111/gec3.12121>.
- Chant, S. (2015). *Female household headship as an asset? Interrogating the intersections of urbanisation, gender, and domestic transformations* (pp. 33–51). Routledge: Gender, Asset Accumulation and Just Cities.



- Coffey, D., Khera, R., & Spears, D. (2016). *Intergenerational effects of women's status: Evidence from joint Indian households*. Princeton: Paper presented at the Economic Demography Workshop. <https://pdfs.semanticscholar.org/55ec/b391da79a2254d1ca80b6c24aa49e74259.pdf>.
- Cole, S., Giné, X., Tobacman, J., Topalova, P., Townsend, R., & Vickery, J. (2013). Barriers to household risk management: Evidence from India. *American Economic Journal: Applied Economics*, 5(1), 104–135.
- Coulthard, S., Johnson, D., & McGregor, J. A. (2011). Poverty, sustainability and human wellbeing: A social wellbeing approach to the global fisheries crisis. *Global Environmental Change*, 21, 453–463. <https://doi.org/10.1016/j.gloenvcha.2011.01.003>.
- de Haan, A., Brock, K., Carswell, G., Coulibaly, N., Seba, H., & Ali Toufique, K. (2000). *Migration and livelihoods: Case studies in Bangladesh, Ethiopia and Mali* IDS Research Report 46. Brighton: Institute of Development Studies.
- Deressa, T. T., Hassan, R. M., & Ringler, C. (2011). Perception of and adaptation to climate change by farmers in the Nile basin of Ethiopia. *The Journal of Agricultural Science*, 149, 23–31. <https://doi.org/10.1017/S0021859610000687>.
- Djoudi, H., & Brockhaus, M. (2011). Is adaptation to climate change gender neutral? Lessons from communities dependent on livestock and forests in northern Mali. *International Forestry Review*, 13, 123–135. <https://doi.org/10.1505/146554811797406606>.
- Djoudi, H., Locatelli, B., Vaast, C., et al. (2016). Beyond dichotomies: Gender and intersecting inequalities in climate change studies. *Ambio*, 45, 248–262. <https://doi.org/10.1007/s13280-016-0825-2>.
- Ellis, F. (2000). *Rural livelihood diversity in developing countries: Evidence and policy implications*. London: Overseas Dev Institute.
- Engle, N. L. (2011). Adaptive capacity and its assessment. *Global Environmental Change*, 21(2), 647–656.
- Flato, M., Mutarak, R., & Pelsler, A. (2017). Women, weather, and woes: The triangular dynamics of female-headed households, economic vulnerability, and climate variability in South Africa. *World Development*, 90, 41–62. <https://doi.org/10.1016/j.worlddev.2016.08.015>.
- Ford, J. D., Berrang-Ford, L., Bunce, A., et al. (2014). The status of climate change adaptation in Africa and Asia. *Regional Environmental Change*. <https://doi.org/10.1007/s10113-014-0648-2>.
- Gladwin, C. H., Thomson, A. M., Peterson, J. S., & Anderson, A. S. (2001). Addressing food security in Africa via multiple livelihood strategies of women farmers. *Food Policy*, 26, 177–207. [https://doi.org/10.1016/S0306-9192\(00\)00045-2](https://doi.org/10.1016/S0306-9192(00)00045-2).
- Coh, A. H. X. (2012). A literature review of the gender-differentiated impacts of climate change on women's and men's assets and well-being in developing countries. CAPRI Working Paper No. 106. Washington, D.C.: International Food Policy Research Institute. <http://dx.doi.org/10.2499/CAPRIWP106>.
- Grown, C. A., & Sebstad, J. (1989). Introduction: Toward a wider perspective on women's employment. *World Development*, 17, 937–952.
- Haigh, C., & Valley, B. (2010). Gender and the climate change agenda: The impacts of climate change on women and public policy. Women's Environmental Network, London.
- Hamilton, S., Dewalt, B. R., & Barkin, D. (2003). Household welfare in four rural Mexican communities: The economic and social dynamics of surviving national crises. *Mexican Studies/Estudios Mexicanos*, 19(2), 433–462.
- Harriss-White, B. (1997). Gender bias in intrahousehold nutrition in South India: Unpacking households and the policy process. In L. Haddad, J. Hoddinott, & H. Alderman (Eds.), *Intrahousehold resource allocation in developing countries: models, methods, and policy* (pp. 194–212). Baltimore: John Hopkins University Press.
- Harriss-White, B., & Garikipati, S. (2008). India's semi-arid rural economy: Livelihoods, seasonal migration and gender. *The European Journal of Development Research*, 20(4), 547–548.
- Hoque, S. F., Quinn, C. H., & Sallu, S. M. (2017). Resilience, political ecology, and well-being: An interdisciplinary approach to understanding social-ecological change in coastal Bangladesh. *Ecology and Society*, 22, art45. <https://doi.org/10.5751/ES-09422-220245>.
- Hunter, L. M., & David, E. (2009). *Climate Change and Migration: Considering Gender Dimensions*. IBS Population Program Working Paper (p. 33). Boulder: University of Colorado.
- International Organization for Migration (2015). World migration report 2015. Migrants and cities: New partnerships to manage mobility.
- IPCC. (2014). Climate Change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. (Eds.), *Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
- IPCC. (2018). Annex I: Glossary [R. Matthews (ed.)]. In V. Masson-Delmotte, et al. (Eds.), *Global warming of 1.5 °C. An IPCC Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*.
- Jackson, C. (1993). Doing what comes naturally? Women and environment in development. *World Development*, 21, 1947–1963. [https://doi.org/10.1016/0305-750X\(93\)90068-K](https://doi.org/10.1016/0305-750X(93)90068-K).
- Jackson, C. (2015). Modernity and matrifocality: The feminization of kinship? *Development and Change*, 46, 1–24. <https://doi.org/10.1111/dech.12141>.
- Jerneck, A. (2017). Taking gender seriously in climate change adaptation and sustainability science research: Views from feminist debates and sub-Saharan small-scale agriculture. *Sustainability*. <https://doi.org/10.1007/s11625-017-0464-y>.
- Jiggins, J. (1986). Women and seasonality: Coping with crisis and calamity. *IDS Bulletin*, 17, 9–18. <https://doi.org/10.1111/j.1759-5436.1986.mp17003003.x>.
- Jost, C., Kyazze, F., Naab, J., et al. (2015). Understanding gender dimensions of agriculture and climate change in smallholder farming communities. *Climate and Development*, 5529, 1–12. <https://doi.org/10.1080/17565529.2015.1050978>.
- Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and Change*, 30, 435–464. <https://doi.org/10.1111/1467-7660.00125>.
- Kilroy, G. (2015). A review of the biophysical impacts of climate change in three hotspot regions in Africa and Asia. *Regional Environmental Change*, 15, 771–782. <https://doi.org/10.1007/s10113-014-0709-6>.
- Lawson, E. T., Alare, R. S., Salifu, A. R. Z., & Thompson-Hall, M. (2019). Dealing with climate change in semi-arid Ghana: Understanding intersectional perceptions and adaptation strategies of women farmers. *Geoforum*. <https://doi.org/10.1007/s10708-019-09974-4>.
- Lockwood, M., Raymond, C. M., Oczkowski, E., & Morrison, M. (2015). Measuring the dimensions of adaptive capacity: a psychometric approach. *Ecology and Society*, 20.
- Masters, W. A., Djurfeldt, A. A., De Haan, C., et al. (2013). Urbanization and farm size in Asia and Africa: Implications for food security and agricultural research. *Global Food Security*, 2, 156–165. <https://doi.org/10.1016/j.gfs.2013.07.002>.
- Miller, B. D. (1997). Social class, gender and intrahousehold food allocations to children in South Asia. *Social Science and Medicine*, 44(11), 1685–1695.
- Mortreux, C., & Barnett, J. (2017). Adaptive capacity: Exploring the research frontier. *WIREs Climate Change*, 1–12. <https://doi.org/10.1002/wcc.467>.
- Mueller, V., Kovarik, C., Sproule, K., & Quisumbing, A. R. (2015). Migration, gender, and farming systems in Asia: Evidence, data, and knowledge gaps. 36.
- Nabikolo, D., Bashaasha, B., Mangeni, M., & Majaliwa, J. (2012). Determinants of climate change adaptation among male and female headed farm households in eastern Uganda. *African Crop Science J*, 20, 203–212.
- Nguyen, M. T. N. (2014). Translocal householding: Care and migrant livelihoods in a waste-trading community of Vietnam's Red River Delta. *Dev Change*, 45, 1385–1408. <https://doi.org/10.1111/dech.12130>.
- Niang, I., Dansokho, M., Faye, S., et al. (2010). Impacts of climate change on the Senegalese coastal zones: Examples of the Cap Vert peninsula and Saloum estuary. *Global Planetary Change*, 72, 294–301. <https://doi.org/10.1016/j.gloplacha.2010.01.005>.
- Niehof, A. (2004). The significance of diversification for rural livelihood systems. *Food Policy*, 29, 321–338. <https://doi.org/10.1016/j.foodpol.2004.07.009>.
- Nyantakyi-Frimpong, H., & Bezner-Kerr, P. (2015). The relative importance of climate change in the context of multiple stressors in semi-arid Ghana. *Global Environmental Change*, 32, 40–56. <https://doi.org/10.1016/j.gloenvcha.2015.03.003>.
- O'Laughlin, B. (2007). A bigger piece of a very small pie: Intrahousehold resource allocation and poverty reduction in Africa. *Development and Change*, 38, 21–44. <https://doi.org/10.1111/j.1467-7660.2007.00401.x>.
- Ober, K. (2014). TransRe fact sheet How the IPCC views migration: An assessment of migration in the IPCC AR5 WGII Report - TransRe Fact Sheet.
- Olsson, P., Opondo, P., Tschakert, P., et al. (2014). Livelihoods and poverty. In *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change* (pp. 793–832).
- Pelling, M., & High, C. (2005). Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change*, 15, 308–319. <https://doi.org/10.1016/j.gloenvcha.2005.02.001>.
- Perez, C., Jones, E. M., Kristjansson, P., et al. (2015). How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Global Environmental Change*, 34, 95–107. <https://doi.org/10.1016/j.gloenvcha.2015.06.003>.
- Petzold, J., & Ratter, B. M. W. (2015). Climate change adaptation under a social capital approach—An analytical framework for small islands. *Ocean Coastal Management*, 112, 36–43. <https://doi.org/10.1016/j.ocecoaman.2015.05.003>.
- Poonacha, P., Rai Chowdhury, A., & Kaur, H. (2018). *Gendered dimensions of peri-urban transitions in the Bangalore metropolitan region – Implications for adaptive capacities of households*. Cape Town, South Africa: ASSAR Short Report.
- Posel, D. (2001). How do households work? Migration, the household and remittance behaviour in South Africa. *Social Dynamics*, 27(1), 165–189. <https://doi.org/10.1080/02533950108458709>.
- Prasad, V., Helfrich, M., & Crate, S. A. (2009). Social capital as a source of adaptive capacity to climate change in developing countries. *International Journal of Climate Change Impacts and Responses*, 1, 149–162.
- Pretty, J. (2003). Social capital and the collective management of resources. *Science* (80-), 302, 1912–1914.
- Punch, S., & Sugden, F. (2013). Work, education and out-migration among children and youth in upland Asia: Changing patterns of labour and ecological knowledge in an era of globalisation. *Local Environment*, 18, 255–270. <https://doi.org/10.1080/13549839.2012.716410>.
- Quinn, C. H., Huby, M., Kiwasila, H., & Lovett, J. C. (2003). Local perceptions of risk to livelihood in semi-arid Tanzania. *Journal of Environmental Management*, 68(2), 111–119.
- Quinn, C. H., Zervogel, G., Taylor, A., Takama, T., & Thomalla, F. (2011). Coping with multiple stresses in rural South Africa. *Ecology and Society*, 16(3), 10.



- Rademacher-schulz, C., Schraven, B., & Mahama, E. S. (2014). Time matters: Shifting seasonal migration in Northern Ghana in response to rainfall variability and food insecurity. *Climate and Development*, 6, 46–52. <https://doi.org/10.1080/17565529.2013.830955>.
- Ramarao, M. V. S., Sanjay, J., Krishnan, R., et al. (2018). On observed aridity changes over the semi-arid regions of India in a warming climate. *Theoretical and Applied Climatology*, 1–10. <https://doi.org/10.1007/s00704-018-2513-6>.
- Rao, N. (2019). From abandonment to autonomy: Gendered strategies for coping with climate change, Isiolo County, Kenya. *Geoforum*, 102, 27–37.
- Rao, N. (2015). Marriage, violence, and choice: Understanding Dalit women's agency in rural Tamil Nadu. *Gender and Society*, 29(3), 410–433.
- Rao, N. (2014). Caste, kinship and life-course: Rethinking women's work and agency in rural South India. *Feminist Economics*, 20(4), 78–102.
- Rao, N. (2012a). Breadwinners and homemakers: Migration and changing conjugal expectations in rural Bangladesh. *Journal of Development Studies*, 48, 26–40.
- Rao, N. (2012b). Male "providers" and female "housewives": A gendered co-performance in rural North India. *Development and Change*, 43, 1025–1048. <https://doi.org/10.1111/j.1467-7660.2012.01789.x>.
- Rao, N., Gazdar, H., Chanchani, D., & Ibrahim, M. (2019a). Women's agricultural work and nutrition in South Asia: From pathways to a cross-disciplinary, grounded analytical framework. *Food Policy*, 82, 50–62.
- Rao, N., Mishra, A., Prakash, A., Singh, C., Qaisrani, A., Poonacha, P., Vincent, K., & Bedellian, C. (2019b). Women's agency and adaptive capacity in climate change hotspots: A qualitative comparative analysis from Asia and Africa. *Nature Climate Change* (in press).
- Rao, N., Lawson, E. T., Raditloane, W. N., et al. (2017). Gendered vulnerabilities to climate change: Insights from the semi-arid regions of Africa and Asia. *Climate and Development*, 1–13. <https://doi.org/10.1080/17565529.2017.1372266>.
- Ravera, F., Iniesta-Arandia, I., Martín-López, B., et al. (2016). Gender perspectives in resilience, vulnerability and adaptation to global environmental change. *Ambio*, 45, 235–247. <https://doi.org/10.1007/s13280-016-0842-1>.
- Ray, D. (2006). Aspirations, poverty, and economic change. *Understanding Poverty*. <https://doi.org/10.1093/0195305191.003.0028>.
- Reader, C. S. (2007). The other side of agency. *Philosophy*, 82, 579–604.
- Ribot, J. C., Magalhães, A. R., & Panagides, S. (2005). *Climate variability, climate change and social vulnerability in the semi-arid tropics*. Cambridge University Press.
- Rigg, J. (2006). Land, farming, livelihoods, and poverty: Rethinking the links in the Rural South. *World Development*, 34, 180–202. <https://doi.org/10.1016/j.worlddev.2005.07.015>.
- Rivers, L., Ill, Sanga, U., Sidibe, A., Wood, A., Paudel, R., Marquart-pyatt, S. T., et al. (2017). Mental models of food security in rural Mali. *Environment Systems and Decisions*, (December). <https://doi.org/10.1007/s10669-017-9669-y>.
- Robson, J. P., & Nayak, P. K. (2010). Rural out-migration and resource-dependent communities in Mexico and India. *Population and Environment*, 32, 263–284. <https://doi.org/10.1007/s11111-010-0121-1>.
- Salifu, A. R., Lawson, E. T., & Wrigley-Asante, C. (2016). *Social differentiation and adaptive responses adopted by farmers in a water scarce landscape: The case of groundnut farmers in the Lawra and Nandom Districts*. University of Ghana.
- Sarr, B. (2012). Present and future climate change in the semi-arid region of West Africa: A crucial input for practical adaptation in agriculture. *Atmospheric Science Letters*, 13, 108–112. <https://doi.org/10.1002/asl.368>.
- Schatz, E., Madhavan, S., & Williams, J. (2011). Female-headed households contending with AIDS-related hardship in rural South Africa. *Health and Place*, 17, 598–605. <https://doi.org/10.1016/j.healthplace.2010.12.017>.
- Scheibelhofer, E. (2017). Shifting migration aspirations in second modernity. *Journal of Ethnic and Migration Studies*, 9451, 1–15. <https://doi.org/10.1080/1369183X.2017.1384151>.
- Seebens, H. (2011). *Intra-household bargaining, gender roles in agriculture and how to promote welfare enhancing changes*. Food and Agriculture Organization of the United Nations.
- Sen, A. (1990). Gender and cooperative conflicts. In I. Tinker (Ed.), *Persistent inequalities: Women and world development* (pp. 123–149). New York: Oxford University Press.
- Shankar, K. R., Nagasree, K., & Sankar, G. R. M., et al. (2013). Farmers' perceptions and adaptation measures towards changing climate in South India and role of extension in adaptation and mitigation to changing climate. Hyderabad.
- Shipton, P. (1990). African famines and food security: Anthropological perspectives. *Annual Review of Anthropology*, 19(1), 353–394.
- Singh, C., Osbahr, H., & Dorward, P. (2018a). The implications of rural perceptions of water scarcity on differential adaptation behaviour in Rajasthan India. *Regional Environmental Change*. <https://doi.org/10.1007/s10113-018-1358-y>.
- Singh, C., Rahman, A., Srinivas, A., & Bazaz, A. (2018b). Risks and responses in rural India: Implications for local climate change adaptation action. *Climate Risk Management*, 21, 52–68. <https://doi.org/10.1016/j.crm.2018.06.001>.
- Singh, C. (2019a). Migration as a driver of changing household structures: Implications for household livelihoods and adaptation. *Migration and Development*. <https://doi.org/10.1080/21632324.2019.1589073>.
- Singh, C. (2019b). Of borewells and bicycles: The gendered nature of water access and its implications on local adaptive capacity. *Routledge Handbook of Gender and Climate Change in South Asia*.
- Singh, C., & Basu, R. (2019). Moving in and out of vulnerability: Interrogating migration as an adaptation strategy along a rural urban continuum in India. *The Geographical Journal* (in press).
- Solomon, D., & Rao, N. (2018). Wells and Wellbeing: Gender dimensions of groundwater dependence in South India. *Economic and Political Weekly*, 53, 38–45.
- Suckall, N., Fraser, E., & Forster, P. (2016). Reduced migration under climate change: Evidence from Malawi using an aspirations and capabilities framework. *Climate & Development*, 5529, 1–15. <https://doi.org/10.1080/17565529.2016.1149441>.
- Sultana, F. (2014). Gendering climate change: Geographical insights. *The Professional Geographer*, 66(3), 372–381.
- Szabo, S., Adger, W. N., & Matthews, Z. (2018). Home is where the money goes: Migration-related urban-rural integration in delta regions. *Migration and Development*, 2324, 1–17. <https://doi.org/10.1080/21632324.2017.1374506>.
- Thomas-Slayter, B. P. (1992). Politics, class, and gender in African resource management: The case of rural Kenya. *Economic Development and Cultural Change*, 40(4), 809–828.
- Thorat, S., & Newman, K. S. (2010). *Blocked by caste: Economic discrimination in modern India*. New Delhi: Oxford University Press.
- Toole, S., Klocker, N., & Head, L. (2016). Re-thinking climate change adaptation and capacities at the household scale. *Climatic Change*, 135, 203–209. <https://doi.org/10.1007/s10584-015-1577-x>.
- Tschakert, P., & Machado, M. (2012). Gender justice and rights in climate change adaptation: Opportunities and pitfalls. *Ethics and Social Welfare*, 6, 275–289. <https://doi.org/10.1080/17496535.2012.704929>.
- Van Aelst, K., & Holvoet, N. (2016). Intersections of gender and marital status in accessing climate change adaptation: Evidence from rural Tanzania. *World Development*, 79, 40–50. <https://doi.org/10.1016/j.worlddev.2015.11.003>.
- White, S. C. (2010). Analysing wellbeing: A framework for development practice. *Development in practice*, 20(2), 158–172.
- White, S. C. (2015a). Introduction: The many faces of wellbeing. In S. White (Ed.), *Cultures of wellbeing: Method, place, policy* (pp. 1–44). Basingstoke UK: Palgrave Macmillan.
- White, S. C. (2015b). *Relational wellbeing: A theoretical and operational approach*. UK: Bath.
- Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). *At risk: Natural hazards, people's vulnerability and disasters* (2nd ed.). London: Routledge.
- World Bank. (2018). Groundswell: Preparing for internal climate migration. [doi.org/10.1596/29461](https://doi.org/10.1596/29461).
- Yaduvanshi, A., Zaroug, M., & Bendapudi, R. (2018). Regional impacts of 1.5 and 2.0 degree Global warming: implications on vulnerabilities across India. *Conference presentation at Adaptation Futures 2018, Cape Town, South Africa*. [http://www.uct.ac.za/sites/default/files/image\\_tool/images/138/AF2018/posters/WOTR%20Aradhana-P125-19june.pdf](http://www.uct.ac.za/sites/default/files/image_tool/images/138/AF2018/posters/WOTR%20Aradhana-P125-19june.pdf).
- Zaroug, M., New, M., & Lennard, C. (2019). Climate change in African countries at 1.5 and 2.0 degrees: variation by geography, aridity and continentality. ASSAR Working Paper 4, p. 23. Cape Town, South Africa.